

Gem Analysis

Below, Robert S. Peebles is examining a gem specimen through an instrument—called a cathodoluminoscope—that magnifies the specimen and also produces heat-generated light emissions that bring out special features of importance in gemological analysis. Peebles is president of World Gem Laboratory, Minden, Nevada, which appraises gems, leases gemological equipment and conducts research toward more effective methods of analyzing gems and minerals.

At right is a magnified view of a natural diamond under heat-induced luminescence. The blue-green and red areas indicate hot spots where the gem would



fracture if stressed. Examinations like this can reveal whether a stone can be successfully cut, a major factor in a gem's value. World Gem Laboratory uses the cathodoluminoscope for such purposes as study of growth and strain patterns in diamonds, detection of dyes in jade, and analysis of the growth and structure of rubies and sapphires. Used in combination with other tests, these analyses can separate synthetic from natural gems, a matter of prime economic importance because the value of a natural gem can be 20 times that of a synthetic.

World Gem Laboratory benefited from NASA technology developed by Jet Propulsion Laboratory (JPL) to help crime laboratories assess physical



evidence. The JPL technique utilizes the phenomenon of thermoluminescence—heat-induced light emissions—to analyze the composition of evidence materials, allowing determination of whether two items issued from the same or different sources. Thermoluminescence and cathodoluminescence are closely related in many respects, and there is very little information available on either subject. So when Peebles read a published account of JPL's work, he sought and received detailed technical information about the NASA development. He credits the information with substantially increasing his general understanding of luminescence, hence his ability to develop new analytical techniques.